

clear up, as did the one above mentioned as being seen with Dr. J. D. Arnold, under the vigorous inunction of mercury combined with an internal treatment with iodid of potash. Sometimes such a treatment secures, as in the other case, only temporary benefit. The disease is peculiarly distressing as the raw surfaces make eating very painful, and the annoyance is present day and night with every movement of the mouth or tongue.

There is another late lesion of syphilis of the tongue that is difficult to manage with the old methods of treatment, but clears up under salvarsan. It is a low grade irritable inflammation of the side of the tongue. Far back opposite the molars the surface rises up into obtuse lumps like papules separated by cracks. This lumpy formation is not papular at all in the sense of being local syphilitic deposits, but is the result of the accentuation of the anatomy of this part of the tongue. This syphilide clears up readily under salvarsan. There is still another late syphilide located on the inner surface of the lower lip that is refractory to treatment by the old methods, and which should be readily manageable under salvarsan. It consists of plateau-like elevations having a number of minute gray depressions on their flat surfaces. They look like condylomata, but are flatter, and more permanent. The best local treatment is cauterization with acid nitrate of mercury. I have never had the opportunity of treating them with salvarsan, but I should think the new remedy would be admirably suited for them.

It may be added that this paper deals only with the treatment of the lesions mentioned in its title, and that the question of the cure of syphilis in a general sense is not here considered.

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SALVARSAN IN SYPHILITIC DISEASE OF THE NERVOUS SYSTEM.*

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In this paper we wish to report our experience in treating 28 cases of syphilis of the nervous system by salvarsan. The majority of these cases were followed in the Division of Medicine of Leland Stanford Jr. Univ. No other anti-syphilitic treatment was given as a rule after salvarsan. Before entering upon a description of these cases we wish to make mention of a few important articles which have appeared upon this subject.

Marinesco¹ of Budapest was one of the first to publish the results of his experiences. In his series of tabetics he found that salvarsan had a beneficial effect in cases where mercury had no ef-

fect, and also found that it acted more quickly than mercury.

In the Fifth Annual Meeting of the German Neurological Society in Frankfort² in October of last year, salvarsan was discussed by the leading neurologists in Germany. Oppenheim had 65 cases of tabes and general paresis to report. His results appeared to be so unsatisfactory that he considers the use of salvarsan to be contraindicated after a positive diagnosis has been made in these diseases. Nonne was more conservative but thought that expectations had not been fulfilled in the treatment of parasymphilitic diseases by salvarsan. In the same meeting Finger still maintained that the neuro-recidives following the administration of the drug were evidence of acute arsenical poisoning and stated that these nervous relapses occur in psoriasis, lichen ruber and lupus treated by salvarsan.

In an article³ in the Muenchner Medizinische Wochenschrift in November last Ehrlich states that he believes the drug to be no more dangerous than chloroform; that the neuro-recidives are no more frequent now than they were formerly with mercury, and that the cases of thrombosis reported may have been due to the use of a too alkaline solution. He makes a point of advising the use of freshly made distilled water in preparing the solution and thinks by this precaution that the reactions often observed may be avoided. He quotes Gennerich in stating that in late and tertiary cases patients may be kept symptom-free by the combined use of salvarsan and calomel injections. He advises against the use of salvarsan in advanced disease of the cardio-vascular system and of the nervous system.

In this country salvarsan was discussed in a joint meeting of the New York, Boston and Philadelphia neurological societies⁴ on Nov. 4, 1911. Weissmann reported 50 cases of nervous disease treated. He reported benefit in paresis, tabes and in cerebro-spinal syphilis. Watermann had 25 cases of tabes to report and noticed improvement in ataxia, in bladder symptoms and in relief from pain. Sachs reported 51 cases and believed that the drug could favorably influence the symptoms in tabes and paresis but had no curative effect.

A question of prime importance in considering this remedy is whether its administration may be followed by serious results. Gaucher⁵ in Paris reports 7 cases of death following the administration of salvarsan and believes the drug to have a toxic action. In Germany, Martius⁶ reviews 18 cases of death in which salvarsan could only be called in question as a causative factor in 7 cases. Almvis⁷, Fisher,⁸ Kannengieser,⁹ Hoffmann¹⁰ and Vecki¹¹ have published instructive cases with autopsy findings. Westfall¹² of Bonn reports a case of death in tabes. A frequent condition found at autopsy in these cases is encephalitis hemorrhagica and parenchymatous degeneration of the internal organs. Sicard and Lhermitte¹³ believe that the drug has a selective toxic action on the eighth pair of cranial nerves. Dosseker¹⁴ in Switzerland reports 13 cases of neurorecidive and concludes that their frequent occurrence since the use

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of salvarsan can only be explained on the basis that the drug plays a part in their production. Lacapère¹⁵ has seen optic atrophy come to a standstill after salvarsan. McClennahan¹⁶ reports a case of optic atrophy in which blindness followed an injection.

In our cases the drug was administered by the intravenous method and only freshly prepared distilled water was used in preparing the solution. In a number of the cases repeated injections were given. At first it was our custom to give larger doses than we give at present, and this may account for the large number of reactions that we have observed. Our percentage of reactions was 52. In 10 per cent. the reaction may be classed as severe, with rise in temperature, increased frequency of the pulse and respiration, headache, vomiting and occasional chill. We have not observed any lasting ill effects from the drug. The Wassermann reaction was held of great value in determining the syphilitic nature of the affection in question: in three cases, however, we administered salvarsan in the presence of a negative Wassermann reaction, and in one case (No. 5) with decided benefit. In six cases there was a positive Wassermann reaction in the spinal fluid when it was negative in the blood. This was found to be the case in four cases of tabes (Nos. 10, 13, 17, 19). In five cases the Wassermann reaction was changed from positive to negative, one of these cases being a case of tabes (No. 6). In two cases not included in our list we held that the administration of salvarsan was contra-indicated. One was a case of tabes with an aortic valvular lesion, the other was a case of general paresis with a marked arterio-sclerosis.

Ten cases of tabes were given salvarsan and we believe improvement has followed in seven cases. In these cases relief from pain was a frequent result, although it was not lasting after a single injection. In one case (No. 20) severe shooting pains disappeared for a period of four months after one injection, and in this case also bladder symptoms were relieved. In two cases we noticed an alteration in the state of the reflexes (Nos. 6, 10). In two cases there was no benefit (Nos. 13, 19). A case markedly improved was one (No. 10) of marked ataxia and muscular weakness. A case which presented gastric crises as the prominent symptom, was improved. A case with a negative Wassermann reaction in the blood and spinal fluid showed a positive reaction in the blood 10 days after the injection ("provokatorische reaktion" of Ehrlich).

We group 12 of our cases under the heading of cerebrospinal syphilis. A case (No. 5) in which the chief complaint was intense headache had freedom from pain for a period of three months and gained five pounds after one injection. The headaches have returned. Three cases (Nos. 8, 9, 15) of hemiplegia complained of headache as a principal symptom. In two of these cases the headaches were somewhat relieved. One of these cases had epileptiform attacks which were not perceptibly influenced. A case of spastic paraplegia of Erb seemed to improve in that the spas-

ticity was not so great. One case in this classification received three injections of salvarsan (No. 14), but was not strikingly benefited. One case (No. 16) appeared to lose ground after the injection.

There were two cases of neurasthenia (Nos. 4, 12) with a positive Wassermann reaction. The first case was in a woman. As a result of the injection she was freed from most of her symptoms and gained over eight pounds. One case of syphilitic polyneuritis (No. 1) and one of facial neuralgia (No. 3) were practically cured. A case of neurorecidive received three injections of salvarsan after his vision began to fail and we believe that salvarsan checked the progress of the optic neuritis where mercury apparently had no effect whatsoever (No. 11). A case of diabetes insipidus (No. 28) with a history of infection and a positive Wassermann reaction was relieved of headaches and eye symptoms and the daily amount of urine voided dropped from 16 to 10½ litres.

There were no cases of general paresis treated.

CONCLUSIONS.

We believe to have in salvarsan a valuable remedy in syphilitic disease of the nervous system.

No serious results have followed its administration in our cases.

The relief obtained from one intravenous injection appears to be temporary in the majority of cases.

On account of the frequency of the reactions it is advisable to give small doses—not over 0.3 gms. in the female and not over 0.4 gms. in the male.

Case 1.—Syphilitic polyneuritis. L. C., age 35, Chinaman, laundryman by occupation. Denied having had an initial lesion. Entered clinic complaining of pain and weakness in arms and legs. Examination showed steppage gait, drop wrist and weakness of the extensor muscles of the arms and legs. Partial reaction of degeneration was found in these muscles. Ptosis of right eyelid. Achilles tendon, patellar tendon and radial reflexes abolished. Diminution of the sensibility to pain and to touch in the extremities more marked in the distal portion. Superficial glandular enlargement. Heart dullness normal, no murmur. No edema. Oct 14, 1911, Wassermann reaction xxx. Oct. 17, salvarsan 0.6 gm. intravenously followed by a slight rise in temperature to 99.8° Fahrenheit. Following salvarsan potassium iodide was given. From the time of the injection patient began to improve for a period of one month and then improvement seemed to cease. Nov. 23, Wassermann reaction xxx. Nov. 28, salvarsan 0.6 gm. intravenously, followed by Fowler's solution of arsenic. Patient improved after this second dose very rapidly. Jan 12, Wassermann reaction ——. Patient had left the hospital in the meanwhile and towards the end of January returned to work. We believe this case to have been one of syphilitic polyneuritis. The case will be published elsewhere in detail.

Case 2.—Meniere's Disease. Syphilis. C. G., age 33, millworker. Came to the clinic complaining of whistling noises in left ear of deafness and of vertigo. Denied having had syphilis. Nov. 24, 1911, Wassermann reaction xxx. Weber lateralized to left, Rinne positive. Schwabach normal. Nov. 25, 1911, salvarsan intravenously. No

reaction. Salvarsan followed by potassium iodide and mercury. Dec. 22, 1911, no improvement.

Case 3.—Facial neuralgia. Syphilis. P. A., age 54, by occupation a cook. Complained of severe facial neuralgia involving the ophthalmic and superior maxillary divisions of the 5th nerve on the left side, and also complained of pain in the region innervated by the occipital nerve on the same side. The trouble had existed for two months. Gave a history of chancre 14 or 15 years previously and treated 7 or 8 months with mercury. Nov. 24, 1911, Wassermann reaction xxx. Nov. 25, salvarsan 0.6 gm. intravenously. Prior to this injection patient had been given various remedies for the relief of his pain which was very severe. The day following the injection the pain was less severe and became less so from day to day. All other medication was discontinued. On Dec. 14, 1911, as patient still had some pain, another dose of salvarsan was given intravenously—0.6 gm. After this injection there was a slight reaction, vomiting, chilly sensations and a temperature of 99.3° Fahrenheit. Dec. 26, 1911, patient continued to improve and on this date was dismissed from the hospital. He was seen once since leaving the hospital and stated that there had been no recurrence.

Case 4.—Syphilis. Neurasthenia. B. H., age 43, housewife. Came to the clinic with the complaint of headache, weakness and stomach trouble. Denied leucic infection. Examination showed a mitral regurgitation well compensated, otherwise examination negative. Nov. 23, 1911, Wassermann reaction xxx. Nov. 25, salvarsan 0.6 gm. intravenously. Complained of slight headache and nausea on afternoon of the same day as the injection. Temperature 99° Fahrenheit. Dec. 1, reports no improvement in condition. Wt. 102½ lbs. Dec. 28, Wassermann reaction ———. Feb. 23, 1912, headaches have disappeared, but patient still complains of weakness. Mar. 20th, weight 110 lbs., a gain of 8¼ lbs. since the injection. Still complains of weakness, but other complaints have been much benefited.

Case 5.—Syphilis. Cephalgia. T. C., age 35, housewife. No history of lues. Complained of severe basal headaches, of vertigo and of general weakness. Examination of patient negative. Patient had received a course of 45 inunctions of mercury prior to which treatment the reaction of Wassermann was positive. In December, 1911, the Wassermann reaction was negative. Dec. 8, lumbar puncture performed. An analysis of the spinal fluid showed no departure from the normal. Patient at this stage complained of great suffering. On Dec. 9, salvarsan 0.3 gm. was given intravenously. There was a severe reaction following consisting of a chill, nausea and vomiting and a temperature of 100° Fahrenheit. The temperature receded the following day but the nausea and vomiting persisted for two days afterwards. On Jan. 5, 1912, reported a steady improvement in the last two weeks. Weight 103½ lbs. Jan. 24, no more headaches. Feb. 23, no more headaches, weight 108 lbs., a gain of 5 lbs. since Jan. 5. On March 29, Wassermann reaction was negative, but the headaches had returned although not severe.

Case 6.—Tabes. Gastric crises. G. G. L., age 41, plasterer by occupation. Denied having had a chancre. Complained of severe attacks of gastric pain with persistent vomiting. These attacks had been present for 2½ years, and three months before coming to the clinic an exploratory laparotomy was performed. Examination: Argyll-Robertson pupils. Patellar tendon reflexes present. The right achilles tendon reflex present, left absent. Heteronymous diplopia. Hypersensitiveness to cold over thighs and trunk. Oct. 20, 1911, Wassermann reaction in the blood xxx; in the spinal

fluid xxx. A cell count in the spinal fluid showed 20 white cells in 1 cmm. Oct. 21, salvarsan 0.6 gm., no reaction. Nov. 1, area of hypersensitiveness to cold diminished, left achilles tendon reflex present. Dec. 14, Wassermann reaction in the blood ———. Feb. 1, gastric crises still persisting but patient thinks that they are not so severe as formerly. Status: Pupils show no change. The left achilles tendon reflex is again absent. This fact was noted on a subsequent examination of the patient in the kneeling position. Babinski's reflex hammer was used. Both patellar tendon and the right achilles tendon reflexes present. A second injection of salvarsan was given—0.6 gm. intravenously as before, but with this injection there was a decided reaction: a pulse of 132, nausea and vomiting and a temperature of 99° Fahrenheit. On April 2, gastric attacks were not so frequent or so severe as formerly, and both patellar and achilles tendon reflexes were found to be present. Wassermann reaction ———.

Case 7.—Tabes. Gastric crises. F. F., Japanese, age 28. Entered the clinical ward of Lane Hospital on Jan. 3, 1912, suffering from severe attacks of gastric pain with nausea and vomiting. Gave a history of chancre 4 years previously. Was treated with inunctions of mercury at this time. Jan. 5, Wassermann reaction (blood) xxx; in spinal fluid xxx. An examination showed a greatly emaciated man with an ataxic gait. The patellar and achilles tendon reflexes were absent. Pupils irregular in contour and reacted sluggishly to light. Jan. 8, salvarsan 0.6 gm. intravenously. Following the injection there was a pulse of 122, but at the same time the patient felt better than he had felt before the injection. Jan. 11, no longer any pain, patient can retain nourishment. States that he feels better and he also looks better. Jan. 24, note in history, "Left hospital much improved." Patient subsequently left for Japan and was lost track of.

Case 8.—Syphilis. Hemiplegia. M. Y., age 24, clerk by occupation. Came to the clinic complaining of paralyzed left side, also of frequent headaches and epileptiform attacks. Denied having had lues, but it was afterwards learned that he had a course of mercurial treatment before coming to the clinic. Dec. 28, 1911, Wassermann reaction in the blood ———. Jan. 5, 1912, Wassermann reaction in the spinal fluid xxx. Jan. 12, salvarsan 0.6 gm. intravenously. Following injection there was headache, nausea and vomiting, but no rise in temperature. Feb. 7, reported one epileptiform attack since the injection, but thought that headaches had not been so severe.

Case 9.—Syphilis. Hemiplegia. Mrs. H., aged 43, housewife. No history of syphilitic infection. Came to the clinic complaining of paralyzed right side, of headaches and of pain and soreness in shoulders and neck. Had not had any anti-syphilitic treatment. Hemiplegia resulted from a stroke four years previously, and at this time patient lost the power of speech for a period of five months. June, 1910, an epileptiform attack. Since this attack has been troubled with headaches and pain above mentioned and with progressive difficulty in walking. An examination presented the signs of an ordinary cerebral hemiplegia. There were no pupillary abnormalities and the fundi were normal. The eye movements were normal and there was no nystagmus. No signs of arterio-sclerosis. Jan. 12, 1912, Wassermann reaction (blood) ———. Spinal fluid: Wassermann ———. Nonne reaction positive, 17 white cells to the cmm. of fluid. Feb. 27, salvarsan 0.4 gm. intravenously, no reaction. Mar. 4, pain not so severe but walk had not improved. Apr. 15, word received from patient, who had since removed to Arizona, that there had been much improvement of late, but no details were given.

Case 10.—Tabes. G. D., age 50, laborer by oc-

cupation. Came to the clinic complaining of difficulty in walking and of progressive weakness. Denies syphilis. Trouble came on gradually two years ago. Was given mercury and potassium iodide by mouth. Examination: Great ataxia and a marked Romberg. Patellar and achilles tendon reflexes absent. Pupils slightly irregular in contour but are equal in size and react promptly to light. Muscular force appears diminished, but there is no muscular atrophy. No gross disturbance of the sensibility. Dec. 14, Wassermann reaction xxx in spinal fluid. Previous to this, the Wassermann reaction was twice negative in the blood—Sept. 19 and Sept. 28, 1911. On Jan. 12, 1912, Wassermann reaction in blood ——. An analysis of the spinal fluid showed no cellular increase and no increase in albumen. Jan. 12, 1912, salvarsan 0.6 gm. intravenously. Temperature following of 99.6° Fahrenheit and slight headache. Feb. 1, patient said that he felt stronger and could walk better. Apr. 3, patient returned to the clinic and reported marked improvement; could walk decidedly better and had gained 5 lbs. An examination showed a return of the patellar tendon reflexes, while the achilles tendon reflexes were absent.

Case 11.—Syphilis. Optic neuro-recursive. B. P., age 24, fruit packer. Oct. 12, 1911, chancre—a virulent infection. Two days later an injection of salvarsan 0.6 gm. Chancre reacted promptly. Five weeks after the injection the vision began to fail. Nov. 30, salvarsan 0.3 gm. Vision in the left eye improved steadily after this injection, which was followed by mercury and potassium iodide. Dec. 20, patient reported at the eye clinic. Report stated that eyes showed great swelling of discs, much exudate and hemorrhage. Dec. 18, Wassermann in blood ——. Jan. 6, 1912, severe iritis. Jan. 7, spinal fluid drawn. Analysis showed no increase in albumen or in cellular elements and the pressure was 130 mm. of fluid in the horizontal position; but the reaction of Wassermann was xxx. Jan. 9, status: No light perception in right eye; left eye hand movements only. Salvarsan 0.6 gm. intravenously, followed by a severe reaction consisting of a chill, headache and a temperature of 101° F. Jan. 11, still no light perception in right eye, but in left eye could count fingers at 12 feet. Jan. 24, blind in right eye, vision in left eye 20/100. At this time complained of pain over body generally. Jan. 25, salvarsan 0.6 gm., no reaction following. On Jan. 30, when last seen, the vision in the left eye had not changed.

Case 12.—Syphilis. Neurasthenia. W. B., age 48, cigarmaker by occupation. Chancre 25 years ago not followed by secondaries. Complained of nervousness, of sleeplessness, of twitching of muscles and of inability to concentrate his mind on his work. An examination showed an irregularity of contour of the right pupil and Abadie's symptom, otherwise there was nothing of importance brought out by the examination. Jan. 31, 1912, Wassermann reaction (blood) xxx. Feb. 20, salvarsan 0.6 gm. intravenously, no reaction. Mar. 20, patient states that his condition has improved somewhat.

Case 13.—Tabes. J. B., age 47, laborer. Came to the clinic complaining of wasting of his muscles, of shooting pains, of failing vision and of inability to empty his rectum. Chancre (?) 14 years ago, no treatment following. His present trouble dated back five years. Since the onset has taken mercury and potassium iodide, but patient stated that he believed that these drugs aggravated rather than improved his condition. The examination showed external strabismus in both eyes and sign of Argyll-Robertson. Atrophy of muscles about the left shoulder. Left tendo achilles reflex absent. Vision diminished in both eyes and fundi pale. Feb. 18, 1912, Wassermann reaction in the blood x—; in the spinal fluid xxx. An analysis of the spinal fluid showed a positive Noguchi test

and 100 white cells in the cmm. A broad band of hyperesthesia to thermic stimuli and to pain was found about the trunk and extending down the thigh on the left side. Feb. 19, salvarsan 0.6 gm. intravenously, followed by a reaction consisting of headache and vomiting on the day of the injection and a temperature of 100° Fahrenheit on the day following. Mar. 27, patient reports no benefit following the treatment. An examination showed no change in the objective symptoms after the injection.

Case 14.—Cerebro-spinal syphilis. J. F. S., age 49, a hoisting engineer. Gave a history of "chancres" 10 years ago not followed by an eruption. Was treated for a period of one year following. Examination in the clinic revealed the presence of a general glandular enlargement, pupillary inequality, arterio-sclerosis and a positive Romberg. Both the patellar and achilles tendon reflexes present. Complained of headaches, of dizziness and of parasthesias in hands. Apr. 18, 1911, Wassermann reaction xxx. Apr. 28, salvarsan intravenously, followed by potassium iodide. May 9, improvement, if any, slight. June 17, Wassermann reaction xx—. June 20, salvarsan followed by potassium iodide. July 22, Wassermann reaction xx—. Given mercurial inunctions. Aug. 19, improvement; Sept. 9, Wassermann xx—. Sept. 13, salvarsan. Sept. 20, no change in condition and advised to continue rubbings. Nov. 13, Wassermann x—. Dec. 11, feels better, headaches have stopped but still feels dizzy.

Case 15.—Syphilis. Hemiplegia. C. P., age 40. History of a chancre four years previously, followed by secondaries. Treated for three years afterwards almost continuously. Hemiplegia (left) had existed for 1½ years. Principal complaint was of frontal and occipital headaches. Jan. 26, 1912, Wassermann xxx. Report from eye clinic: "Temporal side of discs pale. Vision normal." Jan. 30, salvarsan 0.6 gm. intravenously. A slight reaction followed, consisting of vomiting and a temperature of 99.2° Fahrenheit. On Feb. 6, patient was discharged from the hospital, no improvement.

Case 16.—Syphilis. Cephalgia. N. O., age 47, native of Sweden. Entered the clinic on Jan. 8, 1912, complaining of headaches, of pain in the lower part of the spine and in the extremities, and of dizziness. Denies having contracted syphilis. Examination showed a general glandular enlargement. The pupils were equal in size and reacted well to light. The reflexes showed no departure from the normal. There was no involvement of the cranial nerves, no paresis and no disturbance of the sensibility. Jan. 12, Wassermann (blood) xxx. Jan. 17, salvarsan 0.6 gm., no reaction following. Jan. 26, reported at the clinic feeling weak, tired and dizzy. Given mercury and potassium iodide. Feb. 7, had lost 16¼ lbs. in weight in three weeks. Given Fe. Mar. 16, patient left for the country. Word received from him some time later gives the information that he had improved some but that the glands had not decreased in size. One of the glands was excised for examination and showed a chronic lymphadenitis.

Case 17.—Tabes. P. F., age 59, barber by occupation. Chancre 17 years ago. Inunctions for one month following. Present trouble dates back seven years. Received practically no antisyphilitic treatment since the onset of present trouble. Complained of difficulty in walking and of shooting pains in legs. Examination showed a moderate locomotor ataxia, knee jerks absent, Romberg present and Argyll-Robertson pupils. There was marked disturbance of the sensibility. Wassermann reaction (blood) x—; in spinal fluid xx—. Spinal fluid showed the Nonne reaction positive and a cell count of 22 white cells to the cmm. Mar. 8, 1912, salvarsan 0.6 gm. intravenously. Some headache followed the injection, but there was no reaction, properly speaking. Mar. 16, shoot-

ing pains which were severe before the injection have ceased since the injection. Apr. 2, pains have returned, although they are not so severe as formerly. Patient does not notice any marked improvement in his condition.

Case 18.—Syphilis. Radiculitis (lumbar roots). J. C., age 25, laborer. Denies syphilitic infection. Complained of severe backache of two years' standing, and an examination revealed a very rigid lumbar spine. Nov. 23, 1911, Wassermann reaction xxx. Dec. 3, salvarsan 0.6 gm. intravenously, no reaction. For several days following patient had less pain, but pain soon returned. Jan. 3, Wassermann reaction ——. Jan. 24, patient reported no improvement.

Case 19.—Tabes, forme fruste. Female, age 45, housewife. Infection 16 years previously. Was thoroughly treated with mercury at this time. Now complains of headache, of attacks of severe gastric pain and of pain generally over body. Examination revealed inequality of pupils, presence of Abadie's symptom, hypoaesthesia to tactile stimulus about the left nipple and hyperaesthesia to cold about the trunk. The hearing was diminished. There was no Romberg and no ataxia. Jan. 11, 1912, Wassermann in blood negative; in spinal fluid positive. An analysis of the spinal fluid showed 250 white cells to the cmm. Nonne and Noguchi tests positive. Jan. 20, salvarsan 0.4 gm. intravenously, no reaction. Feb. 7, no change in patient's condition. Intramuscular injections of calomel commenced. Mar. 25, patient decidedly improved.

Case 20.—Tabes. M. D., age 45, laborer. Chancre 17 years ago which was treated four or five months. Complained of great difficulty in walking, of shooting pains and of difficulty in holding his urine. Onset of present trouble about 2½ years ago. In July, 1911, entered the City and County Hospital, previous to which time he had very little treatment. At this time the reaction of Wassermann was positive. Examination revealed a great ataxia and a marked Romberg. The knee jerks were almost abolished. The pupils reacted to light. Disturbance of the sensibility was present. The patient was given salvarsan intravenously in Oct., 1911. Soon after the administration of the remedy the shooting pains left him and remained absent for a period of four months. The patient volunteered the information that his bladder symptoms had improved markedly, and on the return of shooting pains of a mild type requested that he be given another injection.

Case 21.—Syphilis. Exophthalmic goitre. Mrs. P., housewife, native of Russia, age 27 years. Came to the clinic complaining of neuralgia in the lower branch of fifth nerve and of headaches. History of chancre followed by secondaries four years previously for which she treated one month. Two years later an eruption believed to be syphilitic was treated for one month. Examination showed a decided enlargement of the thyroid gland, moderate exophthalmos, slight tremor in the right upper extremity and inequality of the palpebral fissures of the two sides. Feb. 24, 1911, Wassermann (blood) xxx. Mar. 11, salvarsan 0.6 gm. followed by a reaction which commenced on the same day as the injection and which persisted on the following day. The temperature rose to 100.8° Fahrenheit, the pulse was 98, and the respiration 56. There was vomiting. On the second day the pulse rose to 104 while the temperature and the respiration dropped, the latter being 24. Mar. 14, patient left the hospital feeling rather weak.

Case 22.—Tabes. P. C., age 50, longshoreman. Complained of difficulty in walking and of severe shooting pains. In 1903 had a "blister" on the penis followed by a skin eruption which was not treated. The trouble in walking and pains in legs came on about two years later. Examination showed: Romberg, marked ataxia and absence of

the tendinous reflexes in the lower extremities. Charcot joint, right knee. Argyll-Robertson pupils. Trouble in urination—slight incontinence and difficulty in starting flow. No optic atrophy. As to previous treatment of this condition he gave a history of being in the City and County Hospital in 1905. Mar. 16, salvarsan 0.45 gm. intravenously, which was followed by a severe reaction—vomiting, dizziness, a temperature for two days following, the highest temperature noted being 99.8° Fahrenheit. Mar. 21, has had shooting pains twice in legs since injection, but they were not severe. States that he can feel with his toes better because he "can count his toes in his shoes." Mar. 26, shooting pains have returned. Apr. 2, pains every night as formerly but not so severe.

Case 23.—Spastic paraplegia of Erb. D., age 43, painter by occupation. Gives a history of a chancre in 1891 for which he treated 1½ years following with mercury. His complaint on entering the clinic was of great stiffness of his legs and great difficulty in walking. The trouble had existed since 1905 and had become progressively worse. Examination showed patient to have a very marked spastic paraplegia with exaggeration of the tendinous reflexes of the lower extremity and both plantar reflexes in extension. There was no disturbance of the sensibility either subjective or objective. Report from the eye clinic: "Disks pale but probably normal." Involvement of both vestibular and cochlear branches of eighth nerve both sides. The spinal fluid was drawn and an analysis showed it to be normal. The Wassermann reaction was made in the following dilutions of the spinal fluid: 0.1 —; 0.5 xxx; 1.0 xxx. Mar. 16, salvarsan 0.45 gm. intravenously, no reaction. Mar. 25, patient says that he can walk decidedly better and says that his eyesight has improved.

Case 24.—Tabes. J. M. M., age 50, a carpenter by occupation. Chancre (?) when 19 years of age for which he received no treatment. Complained of inability to walk, of shooting pains and of incontinence of urine. Trouble had existed seven years. Examination showed a great ataxia, Argyll-Robertson pupils and absence of the tendinous reflexes in the lower extremities. Great disturbance of the sensibility, including the deep sensibility. Perforating ulcer right foot. Patient had received very little treatment since the onset of his trouble. Mar. 21, Wassermann reaction in the blood xxx; in the spinal fluid xxx. An analysis of the spinal fluid showed an increase of albumen and 277 white cells in the cmm. In the stained specimen only lymphocytes and plasma cells were seen. Mar. 23, salvarsan 0.4 gm. intravenously, no reaction. Apr. 5, patient states that he has no pain and there is an improvement in his power to control his flow of urine. An examination shows no change of the objective symptoms present before the injection. Apr. 11, patient states that there is a marked improvement in his bladder condition.

Case 25.—Tabes. M. M., age 48, sailor. Chancre (?) eight years ago not followed by secondaries, for which he treated for a period of three months. Complained of unsteadiness on his legs, of numbness of legs and of difficulty in controlling the flow of urine especially at night. Present trouble dates back five years; since two years had been energetically treated by mercurial rubbings, under which he benefited greatly. Examination shows a marked Romberg, absence of the tendinous reflexes in the lower extremities and diminished sensibility to pain in the legs. The reaction of Wassermann was found negative both in the blood and in the spinal fluid. Analysis of the spinal fluid showed a positive Nonne reaction and a cell count of seven white cells to the cmm. Mar. 26, 1912, salvarsan 0.6 gm. intravenously. In the afternoon of the same day slight nausea and a temperature of 99.2° Fahrenheit. Apr. 6, Wassermann reaction in the blood positive—provokatorische reaktion of Ehrlich.

Case 26.—Syphilis. Cephalgia. Mrs. K., age 48, housewife. Gives a history of what might have been a syphilitic infection 25 years ago: vaginal discharge followed by pains in shins and sore throat. Has had sores on body from time to time up to the present. One year ago was in Lane Hospital and was treated for chronic syphilitic cerebro-spinal meningitis. Was given 30 injections of mer-cac-o-dal followed by potassium iodide and was much benefited. Now complains of headache, chilly feelings and nervousness. Examination showed an unsteady gait, pupillary inequality and irregularity, diminished hearing; otherwise negative. Mar. 29, 1912, Wassermann reaction in the blood xxx; in the spinal fluid ———. An analysis of the spinal fluid showed a normal albumen content and no increase in cellular elements. Mar. 30, salvarsan 0.3 gm. intravenously. With the exception of a temperature of 99.6° Fahrenheit, had no reaction. Apr. 12, patient thinks she is not so nervous since the injection.

Case 27.—Syphilis. Cephalgia. Mrs. S., age 31, housewife. No history of syphilitic infection. Complained of headaches, of attacks of dizziness, of loss of hair and of weakness. A thorough examination failed to reveal any evidence of organic disease. Oct. 20, 1911, Wassermann in blood xxx. Treated by mercurial inunctions. Nov. 9, Wassermann reaction ———, some improvement, and in the meanwhile was given potassium iodide. Jan. 19, 1912, Wassermann reaction ———, improvement continued. Feb. 24, Wassermann xxx; mercurial inunctions resumed. Mar. 22, Wassermann reaction xxx. Advised to enter the hospital for an injection of salvarsan, the symptoms still persisting. Apr. 2, Wassermann reaction in the spinal fluid ———. An analysis of the spinal fluid showed no increase in albumen or in cellular elements. Apr. 2, salvarsan 0.3 gm. intravenously. A temperature of 99.4° Fahrenheit followed and patient complained of great pain in arm injected but there was no headache or nausea. Apr. 10, patient reported at the clinic complaining of headache. There was a temperature of 99.8° Fahrenheit and a pulse of 114.

Case 28.—Syphilis. Diabetes insipidus. A. T., age 37, fireman. History of a chancre 13 years ago for which he was treated for a period of six months following. He entered the clinic complaining of excessive thirst, of excessive urination, of headaches and of occasional diplopia. Present trouble had existed for six years previously, during which time he had been treated energetically with mercury with little if any benefit. At the time of visiting the clinic he was passing 16 quarts of urine a day. Jan. 5, 1912, Wassermann reaction in the blood xxx. Jan. 15, salvarsan 0.6 gm. followed by a reaction consisting of a chill, headache and a temperature of 100.5° Fahrenheit. Jan. 18, passing less urine. Feb. 12, passing as much urine as formerly—33 pints in the last 24 hours; but has gained 9 lbs. in weight and is not troubled with headaches or eye trouble. Feb. 16, salvarsan 0.6 gm., no reaction following. There was no change in the amount of urine excreted following this injection and patient received mercurial inunction for one week. Mar. 11, Wassermann reaction xxx. Mar. 14, salvarsan 0.4 gm. intravenously, followed by nausea and vomiting, slight chill but no rise in temperature. Apr. 1, patient states that he now passes on an average of 10½ quarts of urine a day, a quantity considerably less than that which he voided before the course of treatment was commenced. He thinks he has improved decidedly after the first and third injections.

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A PRELIMINARY REPORT ON TWENTY-THREE CHILDREN TREATED WITH SALVARSAN.*

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The treatment of the cases dealt with in this paper extended over a period of only nine months, the majority having been treated within the past six months; thus only a preliminary report can be made. It is my intention at a future meeting, or in a later paper, to publish further observations on these cases.

All of these children are clinic cases, patients at the children's clinic of the Medical Department of Stanford University. In age, they vary from 14 days to 16 years, and present a varied clinical picture.

The method of dealing with these cases was as follows: On admission to the clinic, a careful family history was taken first to ascertain if there had been early or late congenital symptoms. A thorough physical examination was made, with laboratory examinations of the blood, including a Wassermann test; the urine, and in some cases, the stools were examined. After this routine, the patients were admitted to Lane Hospital, where injections were made, usually in the morning, and unless a reaction occurred, the children were taken home by their parents on the same afternoon. It was intended then to have a Wassermann test done once each month, on every case, and to have reinjections made, the number and dosage of which might be controlled by the serum reports, and the effect of the drug on the original symptoms. It was impossible to carry out this scheme in every case because in a large clinic the dread of hospital treatment, blood taking, as well as the expense keeps many parents from bringing the children regularly. However, in nearly half the cases two injections were given, and from one to four Wassermann tests made in all the cases after the first injection.

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